REMARKS

Claims 1-15 and 21-25 are pending in the application.

Claims 1-15 and 21-25 have been rejected in the Office Action to which the present Reply is responsive. Applicant respectfully traverses these rejections. Based on the present Reply, Applicant respectfully requests reconsideration and withdrawal of the rejections of Applicant's claims, and passage of the present application to allowance and issue.

REJECTIONS OVER HATTORI ET AL. IN VIEW OF MO ET AL. and TSENG

In the Office Action, claims 1-15 and 21-25 were rejected under 35 U.S.C. § 103(a) as obvious over Hattori et al. (U.S. Patent 6,252,294) in view of Mo et al. (U.S. Patent 6,429,481) and Tseng. The Examiner asserted that Hattori teaches various elements of the claimed invention, but admitted that Hattori et al. fails to teach all the features of the claimed invention. The Examiner cited and relied upon Mo et al., contending that Mo et al. remedies some of the admitted deficiencies of Hattori et al. The Examiner resorted to Tseng in order to allegedly find all of the features of Applicant's claimed invention. Applicant respectfully traverses the rejections over Hattori et al. in view of Mo et al. and Tseng for the following reasons.

There Can Be No Prima Facie Obviousness, Since the Combined References Fail to Disclose All the Limitations of Applicant's Claims, There is No Showing of Motivation to Combine and Modify the Prior Art, and There is No Reasonable Probability of Success.

The Examiner asserted that Hattori et al. teaches a process similar to that claimed by Applicant, but admitted that Hattori et al. fails to disclose each gettering plug comprising doped fill material containing a plurality of gettering sites and fails to disclose the doped fill material is polysilicon formed by LPCVD deposition of the silicon and the dopant in the cavity, and fails to disclose that the dopant ions are one or more selected from P, As, Sb, Bi, B, Al, Ga, In, He, Ne, Ar, Kr, Xe and Ge, as recited in various of Applicant's claims.

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Admitting that Hattori et al. fails to disclose doped polysilicon gettering plugs, the Examiner resorted to Mo et al., asserting that Mo et al. discloses "gettering plugs comprising doped fill material containing a plurality of gettering sites wherein the doped fill material is polysilicon formed by deposition of the polysilicon and the dopant in the cavity and that the dopant is P."

The Examiner also admitted that neither Hattori et al. nor Mo et al. discloses the doped fill material is polysilicon formed by LPCVD deposition of the polysilicon and the dopant in the cavity. In order to remedy this deficiency of both the primary and secondary references, the Examiner resorted to Tseng, asserting that Tseng discloses the doped fill material is polysilicon formed by LPCVD deposition of the polysilicon and the dopant in the cavity, citing col. 5, line 63 to col. 6, line 2 and Fig. 15 of Tseng.

Finally, having assembled the selected disclosures from the prior art in order to allegedly find all of the elements of Applicant's claimed invention, the Examiner simply concluded "It would have been obvious to one of ordinary skill in the art of making semiconductor devices to combine the teaching of Hattori, Mo and Tseng to enable the doped fill material of Hattori to be formed."

The Examiner Failed to State a *Prima facie* case of Obviousness

The Examiner has failed to carry the burden of factually supporting the asserted *prima facie* obviousness, which is required under MPEP §2142. The rejection set forth in the present case is based upon clearly erroneous facts and fails to comport with the law. Thus, the rejection fails, both on a factual basis and on a legal basis, to state a *prima facie* case of obviousness. None of the legally required elements of a prima facie case of obviousness is present or has been shown in this case. Therefore, Applicant respectfully traverses this rejection, and respectfully requests the Examiner to reconsider and withdraw the rejections, which cannot stand.

In order to establish a prima facie case of obviousness, the Examiner must establish: (1) some suggestion or motivation either in the references themselves or in the knowledge generally

available to one of ordinary skill in the art, to modify the reference or to combine reference teachings; (2) a reasonable expectation of success; and (3) that the prior art references must teach or suggest all the claim limitations. See MPEP 706.02(j)). The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not be based on the applicant's disclosure. *In re Vaeck*, 20 USPQ2d 1438 (Fed. Cir. 1991).

In the present rejections, the Examiner merely selected, out of context, particular components from the cited references and then concluded that these components can be combined and/or modified to render Appellants' claims obvious. These are, therefore, improper rejections. As set forth in MPEP §2143.01:

> The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed.Cir. 1990).

In the present rejections, the Examiner failed to show any proper motivation for. i.e., the suggested desirability of, making the asserted selections, combinations and modifications in order to arrive at a combination of features similar to that recited in Appellants' claims. These are, therefore, improper rejections. As stated by the Federal Circuit:

> Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching, suggestion or incentive supporting the combination. Under section 103, teachings of references can be combined *only* if there is some suggestion or incentive to do so. (Emphasis in original.)

ACS Hospital Systems, Inc. v. Montefiore Hospital, 221 USPQ 929, 933 (Fed. Cir. 1984). The prior art of record fails to provide any such suggestion or incentive. The Examiner merely contended that the selected particular components of the references *could be* selected, combined or modified, on an ad hoc basis, and has not shown any teaching, suggestion or motivation to

make the selections, combinations and modifications. Accordingly, Applicant respectfully submits that the Examiner erred as a matter of law in concluding that the claimed invention would have been obvious to one of ordinary skill in the art under section 103.

Specifically, Hattori et al. fails to provide any motivation or suggestion to modify the disclosed polysilicon gettering plugs in any way, much less to suggest that they be modified by the addition of any specific dopants. Mo et al. discloses the use of doped polysilicon, but for a wholly different purpose - forming conductive gate electrode 28 - ***not*** for forming a gettering plug. No person of ordinary skill in the art would suggest that the conductive electrode 28 could be used for gettering or is a gettering plug. As pointed out in more detail below, the mere mention of gettering at col. 6, lines 48-51, following disclosure relating to doping the polysilicon to form the conductive electrode 28, is totally unrelated to the conductive electrode 28 and fails to provide the requisite motivation. The mention of gettering in Mo et al. is by way of contrast to the preceding disclosure, ***not*** as any teaching that the conductive electrode 28 could be used for gettering or that doped polysilicon could be substituted for the polysilicon in the gettering structure of Hattori et al. The Examiner's reliance upon this passage is wholly erroneous and cannot provide the requisite factual basis for the conclusion of *prima facie* obviousness. Reliance on this passage can only result from use of improper hindsight, based on Applicant's disclosure, ***not*** on the teachings of the reference.

Furthermore, the Examiner failed to show any facts in support of the required showing of a reasonable expectation of success. The Examiner merely selected components without showing any evidence of how a person of skill in the art could derive a reasonable expectation of success in the asserted selection, combination and modification. For this additional reason, these are improper rejections.

Various elements of Applicant's claimed invention, found in the references and cited and relied upon by the Examiner, are variously available in the prior art, but always with significant differences, as discussed above. The significant differences require selection, combination and modification, for which there must be *both* a motivation *and* a reasonable expectation of success.

Even if all the individual elements could be found in the cited references, there is still no teaching in any of the references to motivate and support the selection, modification and combination of these elements as was done by the Examiner to support the assertion that Applicant's claimed invention would have been obvious. For this reason, the rejection of Applicant's claims is improper. Applicant respectfully requests the Examiner to withdraw the rejection of the presently claimed invention.

As previously noted, Hattori et al. fails to disclose or suggest doped polysilicon as a gettering structure. As noted in the previous Reply, polysilicon is disclosed by Hattori et al. as the gettering material for all of its disclosed embodiments. Hattori et al. simply fails to provide any motivation whatsoever for modifying its specific teachings from the use of polysilicon to the use of any other material.

Mo et al. discloses nothing more than highly conventional doping of semiconductor materials to form conductive components such as the gate electrode 28, which is entirely conventional for forming *conductive* elements. Mo et al. fails to disclose or suggest that the gate electrode 28, formed by doping a polysilicon structure, could act as a gettering plug, or that the process of doping the polysilicon structure could be used in forming a gettering plug.

The Examiner cited col. 6, lines 39-51 and Fig. 1A of Mo et al. as alleged support for the assertion that Mo et al. discloses "doped fill material containing a plurality of gettering sites....". This is clearly erroneous and is a factually incorrect statement of the disclosure of Mo et al. Mo et al. at no time discloses or suggests that the doped polysilicon of the gate electrode 28, or any other doped polysilicon structure of which Applicant is aware, contains a plurality of gettering sites or could be used for gettering. The Examiner's asserted reading of the above-cited disclosure of Mo et al. is misleading because it selectively takes words out of context. The entire cited portion of Mo et al. is reproduced below:

> Next, as shown in FIG. 4e, polysilicon is deposited to fill the trench and cover the surface of the substrate, generally to a thickness of from about 1 to 2 μm depending on the trench width (shown by the dotted lines in FIG. 4e). This layer is

> then planarized by the nature of its thickness relative to the trench width, typically from about 2 to 5 kÅ (indicated by solid lines in FIG. 4e). The polysilicon is then doped to n-type, e.g., by conventional $POCl_3$ doping or by phosphorus implant.
>
> The backside of the wafer need not be stripped (as is conventionally done prior to doping the polysilicon to enhance defect gettering) because any further doping of the highly doped substrate would be unlikely to result in any enhancement in defect gettering.

The latter sentence is separated here, in order to emphasize that it is distinct from the preceding sentences and that the disclosed doping to form the gate electrode has nothing to do with gettering. The mention of gettering in the latter quoted sentence is the only mention of gettering at any time in the entire disclosure of Mo et al. The latter sentence relates only to backside gettering. The latter sentence says nothing about adding dopants to a polysilicon gettering plug. The latter sentence says that the backside of the wafer is conventionally stripped prior to doping to form semiconductor elements (i.e., source, drain), and refers only to a highly doped substrate, not to a doped gettering plug. Neither the above-quoted disclosure, nor any other disclosure in Mo et al., says or suggests anything about doping a polysilicon gettering plug, nor does it say or suggest anything that would lead a person of ordinary skill in the art to use doped polysilicon for a gettering plug.

The Examiner's contention that Mo et al. teaches "doped fill material containing a plurality of gettering sites..." is clearly in error and cannot provide the required factual basis for a *prima facie* obviousness rejection, because the reference simply does not disclose this. Thus, there is nothing in either of Hattori et al. or Mo et al. which in any "hindsight-free" combination would have rendered obvious Applicant's invention, as claimed in independent claims 1, 9 and 21, and therefore any of the claims dependent upon these independent claims.

Thus, the cited references fail to disclose or suggest all the limitations of Applicant's claimed invention. Hattori et al. fails to disclose or suggest, and fails to provide any motivation whatsoever for, substitution of doped polysilicon for the gettering material. The disclosure of Mo et al. fails to provide any suggestion that a doped material could be placed in a plug or trench

as in Hattori et al. The disclosure of Tseng fails to remedy the shortcomings of Hattori et al. and Mo et al.

Since the references fail to disclose all the limitations of the claimed invention, there can be no obviousness.

Since the references fail to disclose all the limitations of the claimed invention, there can be no motivation to make the claimed invention, and no obviousness.

Since the references fail to disclose all the limitations of the claimed invention and fail to provide any motivation, there can be no reasonable likelihood of success in making the alleged combination, and no obviousness.

Thus, the Office Action has stated none of the legally required elements of a case of *prima facie* obviousness. The rejection therefore cannot stand and must be withdrawn.

The Examiner Failed to Respond to Applicant's Arguments

In the section of the final Office Action headed "Response to Applicant's Arguments" the Examiner attempted to rebut Applicant's argument that the *combined* references fail to teach all the limitations of Applicant's claims by arguing in response to an argument not made by Applicant. Specifically, the Examiner "conceded" that "no one of the references teaches all the limitations of the independent claims". ***This is not what Applicant stated.*** Applicant stated and continues to state that the *combined* references fail to teach all the limitations of Applicant's claims. ***In the final Office Action the Examiner failed to rebut this statement of fact.***

The Examiner admitted that he has failed to identify all of the features of Applicant's claimed invention, and in substance admitted to the use of hindsight, since the only way to make the asserted, necessary modification of the disclosures of the references is by improper use of hindsight. The Examiner stated at page 5 of the final Office Action:

> Hattori teaches the method of forming cavities, filling them with fill material and forming condition to getter impurities. Mo is combined for the limitation for forming a doped polysilicon plug.

> Although as the applicant cites, the effect of doping for enhanced gettering may refer to bulk polysilicon, the physical effect would be the same.

This fails to show all the features of Applicant's claimed invention and fails to identify any motivation for the asserted combination of reference features. At no time do the references disclose or suggest and at no time does the Examiner show any teaching that the "doped polysilicon plug" of Mo could be used as a gettering plug in addition to or instead of its sole disclosed use as the gate electrode 28. At no time does the Examiner show any factual basis for the assertion in the final sentence of the above-quoted statement. Nor does the Examiner show how this statement flows from the references. This assertion can only be the result of improper hindsight, since none of the references make any statement which would lead a person of ordinary skill in the art to make this connection.

Thus, the Examiner failed to identify all of the features of Applicant's claimed invention.

The Examiner's other arguments fail to meet the point of Applicant's arguments and facts. For example, the Examiner asserted that "one cannot show non-obviousness by merely attacking references individually where references are based on combinations of references." Applicant has not made any such argument. Rather, Applicant has repeatedly pointed out, and the Examiner has repeatedly failed to rebut, that the *combined* references fail to teach or suggest all the features of Applicant's claimed invention. Based on the foregoing, the rejections cannot stand, since there is no *prima facie* obviousness.

CONCLUSION

Applicant respectfully submits that for at least the foregoing reasons, Hattori et al. in combination with Mo et al. and Tseng fails to disclose or suggest Applicant's presently claimed invention, and the Examiner has failed to state a factually correct or legally proper case of *prima facie* obviousness. Accordingly, Applicant respectfully requests the Examiner to reconsider and

withdraw the rejection of Applicant's claims over the prior art, and to indicate that the claims are allowable. Applicant respectfully requests notice to such effect.

Applicant respectfully submits that all of the presently pending claims 1-15 and 21-25 are allowable over the art of record for the foregoing reasons. Applicant respectfully requests the Examiner to reconsider and withdraw the rejections of Applicant's claims, and to allow the presently pending claims. Notice of Allowance is respectfully requested.

In the event issues remain in the prosecution of this application, Applicants request that the Examiner telephone the undersigned attorney to expedite allowance of the application. Should a Petition for Extension of Time be necessary for the present Reply to the outstanding Office action to be timely filed (or if such a petition has been made and an additional extension is necessary) petition therefor is hereby made and, if any additional fees are required for the filing of this paper, the Commissioner is authorized to charge those fees to Deposit Account #18-0988, Docket No. F0556/AMDSP448US.

Respectfully submitted,

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